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Notes on the occurrence of some Mediterranean dragonflies (Odonata) in Belarus

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ABSTRACT. *Sympecma fusca*, *Lestes viridis* and *Orthetrum albistylum* have been recorded for the first time in Belarus, *Erythromma viridulum* and *Orthetrum brunneum* have been found for the second time in this country. These records are analysed and discussed against Middle and East European data on the expansion of Mediterranean dragonfly species.

KEY WORDS: Odonata, first record, expansion, Mediterranean species, Belarus.

INTRODUCTION

Climate warming effects in huge changes in dragonfly distribution in Europe, in its middle and eastern part among others (DIJKSTRA 2006, OTT 2001). While data on dragonflies of Poland is relatively rich (e.g. BERNARD et al. 2002, BUCZYŃSKI 2007, 2008), Belarus remains "white spot" because the last large-scale studies in this country were conducted in the first half of the 80`s (PISANENKO 1985). Further data are incomplete – particular publications were fragmentary or referred to small areas (BUCZYŃSKI et al. 2006).

The second author of this paper conducted hydrobiological researches of running waters of southern Belarus during which a large collection of dragonflies was gathered. In this collection some southern stagnophiles were found. These species have been unknown from Belarus so far or recorded from a single and unproven study sties. Such records are described and discussed below.

METHODS AND MATERIAL

The studies were conducted in the years 2005 and 2006. They covered 24 localities – the stretches of rivers and canals in southern Belarus. They were situated in river basins of Bug (6 study sites), Pripyat (14) and Dnieper (4).

Species analyzed in this paper were recorded at 8 study sites: 1. Dubok, the River Kopayuvka, 51º40' N, 23º42' E; 2. Orechovo, the River Malorita, 51º38' N, 23º55' E; 3. Otchin, the River Ryta, 51º37' N, 24º02' E; 4. Powitye, Orechovskiy Kanal, 51º59' N, 24º55' E; 5. Radostovo, Belozyorskiy Kanal, 51º58' N, 25º00' E; 6. Lasitsk, the River Styr, 51º55" N, 26º15' E; 7. Rechitsa, the River Goryn, 51º50' N, 26º48' E; 8. Holmech, the River Dnepr, 52º09' N, 30º39' E (Fig. 1).

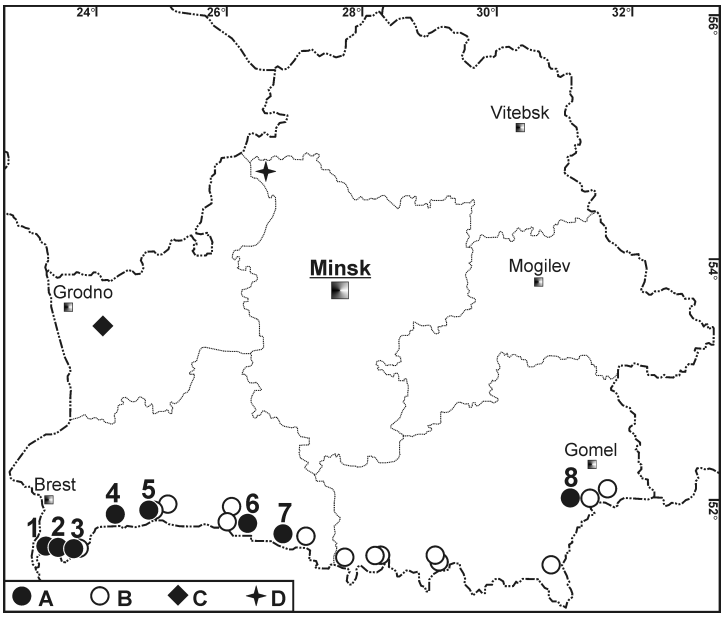

Fig. 1. The area of Belarus. A – localities with recorded species (numbering of localities like in "Methods and material"); B – other localities in this study; C – literature record of *Orthetrum brunneum*; D – literature record of *Erythromma viridulum*.

Kopayuvka, Malorita and Ryta (tributaries of the River Bug), are typical lowland rivers of Polessye – sewered and flowing through open country. They are small (width <10 m), with slow current, brown water, mineral bottom (sandy, silty or mixed one), with peat coating in some places, rich submerged vegetation. In shore zone there is belt with dominating *Acorus calamus* L. as well as patches of *Nuphar lutaea* L. and *Stratiotes aloides* L.

Styr (tributary of the River Pripyat) is a medium lowland river with a natural river-bed, slow current, brown water, bottom of peat and detritus. Vegetation is well developed, either swamps (*Acorus calamus* mainly) or floating (*Stratiotes aloides* mainly). By shores – *Robinia pseudoacacia* L. and mixed forest at some places.

Goryn is the biggest tributary of the River Pripyat. Its river-bed is natural with the width between 150-200 m, water is colourless, bottom of clay. Aquatic vegetation is poorly developed. The river valley is used in agricultural ways.

Dnepr in Holmech is a large lowland river (150 m wide), with natural river-bed, surrounded by alluvial alder-ash forest. Water is colourless, bottom of sand and silt. No submerged vegetation, swamp vegetation is poorly developed.

Canals: Orechovskiy and Belozyorskiy are main draining courses of their regions. They empty into the Dneper-Bug Canal. They are a part of melioration canal system which covers southern Belarus and northern Ukraine. Fens surrounding the canals are drainaged and intensively agriculturally used. Water in canals is light brown to brown, bottom of silt with detritus. By shores the belt of swamp vegetation is developed.

Larvae were caught with a hydrobiological net (semi-quantitative samples), imagines were collected with an entomological net sporadically. At every study site three controls were conducted covering three different aspects of fauna: early spring one (April 2006), late spring one (June 2005) and summer one (August 2005). 1773 larvae and 2 imagines were collected in total, in which at 8 study sites 571 larvae were obtained in general. Evidence material is in the collections of the authors.

RESULTS

Five unknown in Belarus or far-rare dragonfly species have been recorded (Fig. 1):

- *Sympecma fusca* (Vander Linden, 1820): **[locality 4]** – 22 VIII 2005, 2 larvae.
- *Lestes viridis* (Vander Linden, 1825): **[2]** – 8 VI 2005, 1 larva; **[3]** – 8 VI 2005, 1 larva; **[4]** – 9 VI 2005, 2 larvae; **[6]** – 11 VI 05, 8 larvae.
- *Erythromma viridulum* (Charpentier, 1840): **[7]** 10 VI 2005, 3 larvae; **[8]** 13 VI 2005, 4 larvae.
- *Orthetrum albistylum* (Sélys, 1848): **[1]** 7 VI 05, 1 larva; **[5]** – 25 IV 06, 1 larva.
- *Orthetrum brunneum* (Fonscolombé, 1837): **[1]** 20 VIII 05, 3 larvae.

At study sites with the analyzed species 4-18 taxa of dragonfly larvae (4-16 species) were recorded (Table). The most numerous and frequent were the representatives of the family Coenagrionidae, especially: *Erythromma najas*, *Coenagrion puella* and *Ischnura elegans*. Large part of the material (over 30%) comprised, unidentified to the genus level, larvae of Coenagrionidae. They were found at 7 study sites and – most likely belonged to two last species mentioned above.

Analysed Mediterranean dragonfly species located in the dominance structure in the category of subdominants and dominants (cf. TROJAN 1978). To eudominants at single

study sites belonged: *Erythromma viridulum* (study site 7), *Orthetrum albistylum* (study site 5) and *O. brunneum* (study site 1) (Table).

Table. Dragonfly larvae occurring at localities with the recorded species. 1-8 – localities (numbering like in the text).

	Species	Dominance [%]							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1.	*Calopteryx splendens* (HARR.)	5.3		2.5					
2.	*C. virgo* (L.)						0.4		
–.	*Calopteryx* sp.			5.0					
3.	*Sympecma fusca* VANDER L.				2.9				
4.	*Lestes sponsa* (HANSEM.)		5.4	10.0	5.8		0.4		
5.	*L. viridis* (VANDER L.)		2.7	2.5	2.9		2.9		
6.	*Platycnemis pennipes* (PALL.)	31.6					0.4		
7.	*Ischnura elegans* (VANDER L.)		2.7		2.9	44.5		9.1	9.0
8.	*Enallagma cyathigerum* (CHARP.)	5.3					3.3		
9.	*Coenagrion hastulatum* (CHARP.)			2.5				4.5	
10.	*C. lunulatum* (CHARP.)				1.4				
11.	*C. puella* (L.)		40.5	2.5	10.1		35.5	27.3	
12.	*C. pulchellum* (VANDER L.)			7.5	17.4		14.5		
–.	*Coenagrion* sp.				2.9				
13.	*Erythromma najas* (HANSEM.)	10.5	2.7	7.5	14.5	33.3	0.4	9.1	35.0
14.	*E. viridulum* (CHARP.)							13.6	4.0
–.	*Coenagrionidae* n.det.*	10.5	32.4	35.0	21.7		28.6	18.2	51.0
15.	*Gomphus flavipes* (CHARP.)							18.2	
16.	*G. vulgatissimus* (L.)	5.3				11.1			
17.	*Brachytron pratense* (O.F. MÜLL.)				1.4		1.1		
18.	*Aeshna grandis* (L.)			10.0					
19.	*A. mixta* LATR.						1.1		
–.	*Aeshna* sp.						0.4		
20.	*Somatochlora flavomaculata* (VANDER L.)						0.4		
21.	*S. metallica* (VANDER L.)		13.5	12.5			1.8		
22.	*Libellula fulva* (O.F. MÜLL.)						0.4		
23.	*Orthetrum albistylum* (SÉL.)	5.3				11.1			
24.	*O. brunneum* (FABR.)	15.8							
25.	*O. cancellatum* (L.)	10.5			2.9				
26.	*Sympetrum danae* (SULZ.)			2.5					
27.	*S. flaveolum* (L.)						2.9		
28.	*S. sanguineum* (O.F. MÜLL.)				11.6		3.3		
29.	*S. vulgatum* (L.)						2.2		1.0
–.	*Sympetrum* sp.				1.4				

* *Ischnura* sp. or *Coeagrion* sp.

In quantitative structure of the material identified to the species level (Fig. 2), rheophiles were dominating only at study site 1, however, at least they were moderately numerous at study sites: 2, 3 and 7. At other study sites the most numerous were eurybionts with the dominance of over 90%. Moreover, tyrphophiles (study sites: 3, 6 and 7, always not numerous) and small water body species (study sites: 1, 4-8, at study site 7 rather numerous) were also found.

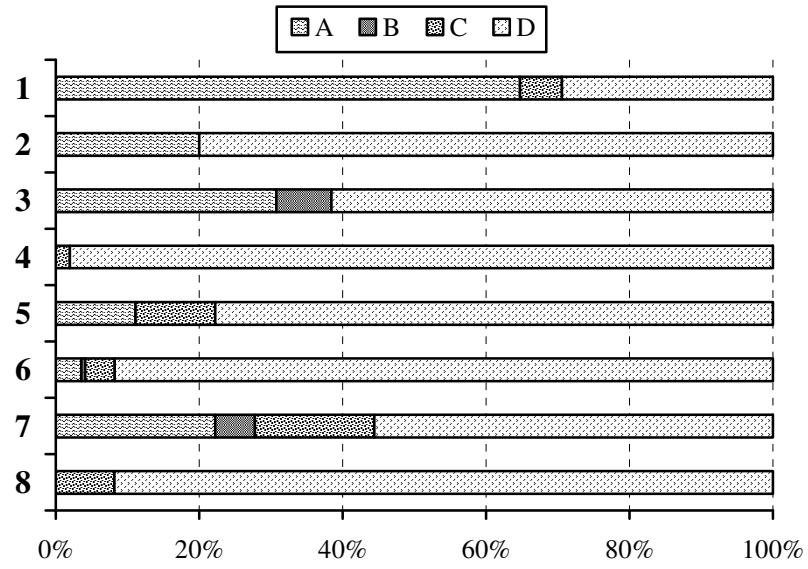

Fig. 2. Ecological composition (quantitative data, material identified to a species level only) at the studied localities (numbering like in "Methods and material"); A – rheophilous species; B – tyrphophilous species; C – species of small water bodies; D – eurybionts.

DISCUSSION

Three species: Mediterranean *Sympecma fusca*, Atlantic-Mediterranean *Lestes viridis* and Pontic-Mediterranean *Orthetrum albistylum* have been recorded for the first time in Belarus. For Pontic-Mediterranean *Erythromma viridulum* and Mediterranean *Orthetrum brunneum*, known from a single localities, new data are the proof of their occurrence in this country (BUCZYŃSKI et al. 2006; DÉVAI 1976).

Erythromma viridulum (larvae, 1987-89) was given from the canal of the basin of Lake Naroch (N Belarus, 54º05' N, 26º04' E) (TISCHIKOV, TISCHIKOV 2000). However, from our

point of view, this data his not reliable for many reasons: the study site, forward far to the north, is very untypical; material was not identified by a specialist; taxonomic names – archaic or even incorrect („*Agrion splendens*", „*Erythromma viridulus*" (sic!), „*Aeschna*") – used in the paper show the lack of orientation within current literature of the subject, or even perhaps in literature for identification. It can be concluded that the data from Rechitsa and Holmech are first confirmed records of the species in the country.

Orthetrum brunneum was recorded in Belarus on the basis of one male caught in the valley of the River Neman in the village Pravye Mosty (NW Belarus, 53º24' N, 23º31' E) (LEVANDOVSKI & MOROZ 2001). Thus the locality in Dubok is the first known place of reproduction of this species in the country.

The recording of so many thermophilous species in running waters, inassociated with this environment except for *Orthetrum brunneum*, may seem untypical. However, the structure of dragonfly assemblages of this habitats – rich in species, with the domination of stagnophiles – shows that conditions are favaurable. This is connected with the character of the study area, especially in the basin of the River Pripyat (marshy, flat area with slow water discharge) as well as in part with anthropogenic changes of waters in the study area.

All of the described species belong to Mediterranean element of European fauna (DÉVAI 1976). In last 20 years the expansion of this element toward the north has been observed. This phenomenon is associated with permanent or temporary inhabiting of new areas or starting successful reproduction in the areas which were visited in the past by migrating individuals irresistant to local climatic conditions (BERNARD et al. 2002, CHAM 2004, DEWICK 2004, DIJKSTRA 2006, OTT 2001). The proceeding of life cycles of some species has been also changed (KETELAAR 2002). However, the picture of the changes is incomplete due to fragmentary information or lack of data from some countries like Russia (Kaliningrad District) and the areas to the east of Belarus and Ukraine and the Belarus itself.

The changes in the dragonfly fauna of western and central Poland reflects the same trends as in the west of Europe, however, farther to the east the borders of geographic ranges may look different. It should be taken into consideration that the border of balance between influences of oceanic and continental climate runs through the east of Poland (MARTYN 1987). It can be clearly seen in the arrangement of isotherms in winter set in more meridional way than parallel: in the region of Suwałki and Brześć District (SW Belarus) the average temperature of January is -4 ºC and in Witebsk District (NE Belarus) is -8 ºC. However, temperatures in winter are crucial factor for embryonic and larval development of dragonflies. Belarus is also characterized by cold and humid summer season (MYDEL & GROCH 2001).

BUCZYŃSKI et al. (2006) presented the list of 14 dragonfly species that can be found in Belarus in the future. Except for *Aeshna serrata* HAG. and *Sympetrum eroticum* (SÉL.), these species have many common features. They are Mediterranean species *sensu lato*. They are usually known from the main part of borderland of Poland and Ukraine with Belarus. Eventually, the expansion of many of them has covered Baltic countries, especially

Lithuania (BERNARD et al. 2002, BERNARD & IVINSKIS 2004, BUCZYŃSKI et al. 2006, DIJKSTRA 2006, GORB et al. 2000). *Sympecma fusca*, *Lestes viridis* and *Orthetrum albistylum* are along with these species.

Among records discussed in this paper, the most valuable for zoogeography of European dragonflies are data on *Lestes viridis*. This is a dragonfly known from northern Poland, recently it has also been recognized in the easternmost part (BUCZYŃSKI et al. 2001). However, in faunistic monograph of the dragonflies of Ukraine (GORB et al. 2000) it was given only from south-western part of the country – to be precise – from two from 24 districts. From northern Ukraine, *L. viridis* was reported by SHESHURAK & PADALKO (1996) only from the vicinity of Chernigiv. In turn, data from Baltic countries is poor and regarded as unproven (DIJKSTRA 2006). The recognition of the species in the large part of the basin of the River Pripyat pinpoints its presence in the adjacent regions of Ukraine and at least scattered occurrence in central Belarus.

The general conclusion from analysed and discussed data is as follows: the influence of climate warming on dragonfly distribution can be seen in the area of Belarus. Probably, we make up for the lack of studies in part. Thus, some species that have been recorded for the first time recently, might have been occurred in last 25 years – i.e. after the studies of PISANENKO (1985). Large gaps in the list of Belarusian dragonflies, especially in Mediterranean species, are also connected with climatic conditions of this country. Just the same – the checklist may be enhanced by 7-8 species in the future. It is only the matter of well focused studies. Faunistic penetration of central and eastern Belarus must be more systematic. Without it the picture of changes in European dragonfly fauna will be still far from complete.

REFERENCES

BERNARD R., BUCZYŃSKI P., TOŃCZYK G. 2002. Present state, threats and conservation of dragonflies (Odonata) in Poland. Nature Conserv. **59**(2): 53-71.

BERNARD R., IVINSKIS P. 2004. *Orthetrum brunneum* (Fonscolombe, 1837), a new dragonfly species in Lithuania (Odonata: Libellulidae). Acta zool. Lit. **14**(3): 31-36.

BUCZYŃSKI P. 2007. Nowe stwierdzenia *Erythromma viridulum* (Charpentier, 1840) na skraju zasięgu w Polsce północnej. Odonatrix **3**(1): 15-18. [In Polish, English summary]

BUCZYŃSKI P. 2008. Extremely northern records of *Sympetrum depressiusculum* (SÉL.) in Poland (Anisoptera: Libellulidae). Notul. odonatol. **7**(1): 11-12.

BUCZYŃSKI P., DIJKSTRA K.-D.B., MAUERSBERGER R., MOROZ M. 2006. Review of the Odonata of Belarus. Odonatologica **35**(1): 1-13.

BUCZYŃSKI P., CZACHOROWSKI S., LECHOWSKI L. 2001. Niektóre grupy owadów wodnych (Odonata, Heteroptera, Coleoptera, Trichoptera) proponowanego rezerwatu „Torfowiska wiszące nad jeziorem Jaczno" i okolic: wyniki wstępnych badań. Rocz. nauk. Pol. Tow. Ochr. Przyr. „Salamandra", 5: 27-42. [In Polish, English summary]

CHAM S. 2004. Observations on an inland population of the Small Red-eyed Damselfly *Erythromma viridulum* (Charpentier) with notes on the first discovery of larvae in Britain. J. Br. Dragonfly Soc. **20**(1): 31-34.

DÉVAI G. 1976: A magyarországi szitakötõ (Odonata) fauna chorológiai elemzése. Acta biol. Debrecina **13**(Suppl. 1): 119-157.

DEWICK S. 2004. An Update of the Continued Succes of Small Red-Eyed Damselfly *Erythromma viridulum* (Charp.) at its First Known British Sites. Atropos **21**: 14-15.

DIJKSTRA K.-D.B. (ed.). 2006. Field Guide to the Dragonflies and Damselflies of Britain and Europe. British Wildlife Publishing, Gillingham, 320 pp.

GORB S.N., PAVLYUK R.S., SPURIS Z.D. 2000. Strekozy (Odonata) Ukrainy: faunisticheskiy obzor. Vestnik Zool., Suppl. 15: 1-154. [In Ukrainian, English summary]

KETELAAR R. 2002. The recent expansion of the Small Red-eyed Damselfly *Erythromma viridulum* (Charpentier) in The Netherlands. J. Br. Dragonfly Soc. **18**(1-2): 1-8.

LEVANDOVSKI K., MOROZ M.D. 2001. *Orthetrum brunneum* (Fonscolombe, 1837) – pervoe upominanie novogo vida strekozy dlya fauny Belarusi. [In:] Raznoobrazie zhivotnogo mira Belarusi – itogi izucheniya i perspektivy sohnaneniya. Materyaly Mezhdunarodnoi nauchnoi konferencyii, Minsk, 28-30 noyabrya 2001 g. Belorusskiy Gosudarvstvennyi universitet, Biologicheski fakultet, Minsk, pp. 97-98. [In Russian]

MARTYN D. 1987. Klimaty kuli ziemskiej. PWN, Warszawa, 667 pp. [in Polish]

MYDEL R., GROCH J. (eds) 2001. Przeglądowy atlas Świata. Europa. Cz. 1. Fogra, Kraków, 303 pp. [In Polish]

OTT J. 2001. Expansion of Mediterranean species in Germany and Europe – consequences of climatic changes. [in:] G.-R WALTER, C.A BURGA, P.J. EDWARDS (eds). "Fingerprints" of Climate Change. Adapted Behaviour and Shifting Species Ranges. Kluwer Academic / Plenum Publishers, New York, Boston, Dordrecht, London, Moscow, pp. 89-111.

PISANENKO A.D. 1985. Faunisticheskiy ocherk strekoz (Insecta, Odonata) Belorusii. Vestn. Bel. gosud. univ. im. V.I. Lenina **II**(3): 37-41. [In Russian]

SHESHURAK P.M., PADALKO T.V. 1996. Ekologo-faunistichniy oglyad babok (Odonatoptera) Chernigivshchini. [in:] P.P. BORSHCHEVSS'KIY et al. (eds). Suchastniy stan ta shlyahi virishennya ekologichnih problem Chernigivs'koi oblasti. Nizhin. Derzh. Pedagog. Inst. "M.V. Gogol", Nizhin: 127-129. [In Ukrainian]

TISCHIKOV G.M., TISCHIKOV I.G. 2000. Faunisticheskiy sostav donnyh makrozoobezpozvogchnyh vodotokov basseyna ozera Naroch. [in:] Lake ecosystems: Biological processes, anthroogenic transformation, water quality. Materials of the International scientific Conference, September 20 – 25, 1999, Minsk – Naroch. Belarussian State University, Minsk, pp. 448-458. [In Russian]

TROJAN P. 1978. Ekologia ogólna. PWN, Warszawa, 418 pp. [In Polish]

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